SCIENCE

NEW YORK, AUGUST 4, 1893.

THE FLORIDA LAND TORTOISE-GOPHER, GOPHERUS POLYPHEMUS.

BY HENRY G. HUBBARD, DETROIT, MICH.

IT seems very strange that so little has been known, or at least has been published about the habits of this very common animal. Winter visitors to Florida and the Gulf States often observe their burrows on the sandy ridges, each with its yawning entrance and scattered mound of subsoil, and are not unlikely to mistake them for the woodchuck holes with which they are familiar at the north. It is the permanent resident, however, that is most likely to have some acquaintance with the animal itself; for only in the hottest weather and at noonday does the gopher leave its burrow to feed upon the surrounding grass and herbage.

In summer, when the thermometer is in the nineties, the animal comes forth daily, some time between the hours of eleven A.M. and two P.M., and takes a careful look around to assure itself that no danger threatens. Then, if no ominous sounds disturb the stillness of the sultry air, it raises itself high on its ungainly legs and starts briskly off for the nearest patch of grass or cultivated field.

For about an hour the gopher wanders about with its long neck outstretched and plucks ravenously at every green vegetable within its reach. Often, indeed, in its eagerness it cracks up and swallows dead twigs and dry leaves together with the more succulent food, until its ravenous appetite is appeased. It then retires to the bottom of its burrow in the moist, cool sand, there to remain until the morrow or, if the season be rainy, until the next dry, hot day.

The gopher is a very timid and alert animal, and although it feeds with great gusto and apparent abandon, it is seldom so absorbed in its work that it fails to hear the sound of approaching footsteps. The near approach of any large amimal sends it scurrying back to its hole. It requires lively work to head off its retreat, but if surprised and captured at a distance from its hole, like other turtles, it retires into its shell, and, drawing its plethoric and scaly fore paws like double doors over the front of its shell, it resigns itself supinely to its fate, and never under any circumstances attempts to bite or otherwise defend itself.

In winter the gopher very rarely quits its burrow, and comes forth to feed only on the very hottest days at noon. In the warm Florida soil it is never torpid, but remains quiescent at the end of its gallery awaiting the return of dog-day weather.

A well grown gopher measures 10 inches in length by 7½ inches in width and 4½ inches in thickness, and weighs about 6 pounds. Individuals are sometimes found measuring 12 × 9¼ × 5 inches, and weighing 9 or 10 pounds.

They are sold in the markets of many towns at high prices, and are eaten by the negroes and lower classes everywhere in the south. The flesh is excellent in quality, very tender, of a rich red color and has the appearance, flavor and odor of beef. But the supply of meat obtainable even from individuals of the largest size is scanty, the greater part of the body cavity being occupied by the enormous gut crammed with grass and the long intestines filled with wads of fibrous dung. The flesh is greatly relished by all carnivorous animals, but a gopher of average size has little to fear from their attacks. The largest dogs are unable to bring their canine teeth to bear upon any vulnerable part unless the specimen is young and small enough to be taken into their mouths.

In May or June the female deposits in the sand outside of her burrow from one dozen to twenty eggs. The eggs are perfectly spherical, pure white in color and have a diameter of 1⅝ inches. More beautiful objects can hardly be found to grace an oölogical cabinet.

The burrows of the gopher are excavated by the aid of a remarkable spade-shaped projection on the front of the under shell, assisted by the powerful fossorial front legs, which are armed for this purpose with strong blunt claws.

In the sandy uplands of Florida the galleries descend at an angle of about 35°, and reach a vertical depth of seven to nine feet from the surface of the ground. They follow a straight course unless deflected by a root or some other obstruction and usually terminate in a layer of indurated soil. The length of the gallery varies from twelve to eighteen feet. The temperature at the lower end does not vary greatly throughout the year, and will generally not fall below 74° in winter nor rise above 79° in summer. The conditions as to moisture are probably equally constant. At Crescent City, Fla., where these observations were made, the permanent water table lies at an average depth of eighteen feet. The burrow of a gopher once completed becomes its permanent residence, and it is with extreme difficulty that the animal can be compelled to vacate and excavate a new home.

It is inhabited by the same individual for long periods of time, and if the popular belief in the great age attained by turtles in general and the land tortoise in particular is well founded, some of these reptilian domiciles may have antedated the present century, and even rival in antiquity the dwellings of man. Certain burrows in this vicinity are pointed out as having been in existence twenty-four years ago, when the oldest orange groves were planted. This necessarily implies a continuous occupancy by the same individual tortoise during that period, since if the galleries are abandoned they shortly become filled up and obliterated in our shifting sand.

Every naturalist will appreciate under the above showing what unusually favorable conditions here exist for the preservation of animal life, and will not be surprised to learn that these little sand caves, with their equable climate, permanent and abundant moisture, perpetually and hospitably open to the outer air, afford an asylum and a domicile to a most interesting assemblage of animals. The list of these, when it shall have been completed, bids fair to become a long one.

Not only the Florida burrowing owl, the rattlesnake, the rabbit, the raccoon and the opossum find in them a temporary shelter, but another vertebrate also, a frog, here takes up its permanent abode and lives on terms of perfect friendship with the gopher. This frog is the sub-species *Rana areolata æsopus*, a beautiful form, with soft subterranean coloration and crepuscular, toad-like habits.[1]

It is not at all rare, nearly every gopher hole harbors one or several specimens. They may be seen at evening sitting just outside the entrance of the burrow, and frequently in the morning or on cloudy days their softly radiant eyes may be detected gleaming out of the shadows a few feet back from the entrance. It is not easy to capture them, except with a baited hook and line, for at the slightest alarm they leap quickly down the yawning throat of the gallery and disappear from view. Specimens of this frog have been seen which would weigh more than a pound, and individuals of colossal proportions are reported to exist.

In January and during July of the present year more than a dozen species of articulates have been discovered living in the gopher holes. The majority are undescribed and new to science.

[1] Mr. Fred'k C. Test, of the National Museum, who kindly determined the species, writes: "Only one specimen, the type, is in the museum collection or presumably in any other." The type specimen came from Micanopy, Fla., probably without notes of habits, etc.

Two only are parasitic upon the gopher: (1) a large tick, which fastens itself upon the skin of the animal or to the sutures of the shell; (2) a gigantic acarus, a quarter of an inch in length, which does not remain upon the body of the gopher but attacks it within the nest, which, like the bed-bug, it never quits. Some of the burrows are infested with these blood-sucking mites and others appear to be entirely free from them.

The dung of the gopher furnishes food to five beetles and one interesting caterpillar of a moth. All of these are new and peculiar forms, presenting characters that indicate subterranean habits of life. A large wingless cave cricket, apparently a *Phalangopsis*, swarms in all the burrows.

Three predatory beetles, one of which, a new species of *Anthicus*, may prove to be a prowler from without, have been found within the galleries.

A very large specimen of the whip-tail scorpion (*Telephonus*) was found in one of the burrows. It was living in a short gallery of its own, which opened into the nest of the gopher at the lowest level. A minute *Pseudo-scorpion* is also found at the lower end of some of the burrows.

A flea of undetermined species, of which a single specimen was found in one of the holes, may prove to be an intruder, left behind possibly by some mammalian visitor.

The following is a review of the animal parasites and messmates of the gopher:

Vertebrate.

1. The gopher frog, *Rana areolata æsopus.*

Articulates.

1. *Copris*, new sp. Feeding upon dung of gopher.
2. *Onthophagus*, sp. Feeding upon dung of gopher.
3. *Saprinus*, new sp. Feeding upon dung of gopher.
4. *Saprinus*, sp. Feeding upon dung of gopher.
5. *Aphodius*, new sp. Feeding upon dung of gopher.
6. *Staphylinide*, probably a Philonthus. Predatory.
7. *Trichopteryx*, sp. A species found also outside.
8. *Anthicus*, new sp. One specimen only.
9. Pyralid moth. Caterpillars feeding upon dung.
10. Cave cricket (undetermined).
11. Acaride parasite of the gopher (undetermined).
12. Gopher tick (undetermined).
13. Pseudo-scorpion (undetermined).
14. Whip-tail scorpion. Predatory intruder.
15. Flea, probably a mammalian parasite.

Most of the insects have been submitted to Mr. E. A. Schwarz, of the Department of Agriculture, Washington, D. C., and to him I am indebted for the determinations given above.

NEW METHODS OF TREATING THE SICK.

BY WILLIAM C. KRAUSS, M.D., BUFFALO, N.Y.

ON June 1, 1889, Professor Brown-Séquard presented a communication to the Société de Biologie of Paris on a new method of therapeutics. It seems that Brown-Séquard had been at work on this project for many years, for, in 1869, he expressed a belief that if it were possible to inject spermatic fluid into the veins of old men they would experience a rejuvenation, sexually, mentally, and physically. After repeated experiments upon rabbits, dogs, and guinea-pigs, he, in a true scientific spirit, injected some of the testicular fluid into his system, and his experiences and results form the most interesting part of his memorable communication to this learned society. "The author of this communication, now 72 years old, has for the past twelve years watched his physical powers slowly and continually decline. The laboratory work has become laborious and heavy, and after each meal I have been obliged to take a short nap. After the third injection a complete change took place. The work in the laboratory has become agreeable, not the least fatiguing, and after three and a half hours of such work I have been able to edit a memoir. The dynamometer showed an increase of 6.7 kilogrammes, the bowels regained their former activity, and, in short, I have regained all that I have lost."

These results, coming from one of the ablest physiologists in France, yea, of the world, were in an incredibly short space of time dispatched to all corners of the earth, and Brown-Séquard's "Elixir of Life," erroneously called, was being tested by hundreds of doctors and would-be scientists.

Enthusiastic reports are not easy to corroborate, and the Elixir of Life was doomed to bitter disappointment. At first encouraging results were reported by a class of observers least fitted to test the virtues of the new discovery, but in a short time the whole proceedings were looked upon with disdain and distrust.

Not so in France, Brown-Séquard published several later reports with equally good results, and the experiments were further conducted by some of his co-workers and students. The hypodermic injections of testicular juice gave encouraging results in anæmia, organic diseases of the brain and spinal cord, cachexia, tuberculosis, and in many of the chronic diseases. It was also found that *ovarian juice* gave nearly the same results as did the testicular juice.

Thyroid juice. It has been definitely proven that removal of the thyroid glands from a dog will be followed by death. Gley, in his experiments, decided to inject the juice of thyroid glands in dogs thus deprived of these glands, and, instead of dying, they recovered without any serious difficulties. In the human family it has been found that after removal of the thyroid gland or the destruction of this gland through disease, that a certain train of symptoms will develop, which had received the name of myxœdema, a disease characterized by swelling of the face, body, and extremities, loss of hair, sub-normal temperature, etc. Horsley attempted to transplant the thyroid gland of animals to these patients, and met with partial success. Dr. Murray of Newcastle, England, then injected hypodermically a glycerine extract of thyroid gland into patients suffering with myxœdema, and his efforts were rewarded with beneficial results. Brown-Séquard and D'Arsonval were conducting similar experiments about the same time with equally good success. It was found, however, that the injection of this substance was followed in many cases with pain, inflammation, and abscess formation. To overcome these hindrances, Fox of Plymouth and Mackenzie advised and practised the treatment of myxœdema by feeding with sheeps' thyroid glands, and the results seemed to be in every way satisfactory.

The writer has had a little experience in treating two cases of myxœdema, but he has been unable to attain anything like the results claimed by the English and French writers. In fact his experience has been negative, not even obtaining temporary improvement.

MacAlister of England has treated cases of pseudo-hypertrophic paralysis with injections of thymus gland extract; also a case of lymphadeuoma with a mixture of red and yellow marrow, with seemingly good results.

Dieulafory of Paris has injected extracts of the cortical portion of the kidney into patients suffering with Bright's disease. He proposes the name Nephrine for this particular fluid.

Comby and Dieulafory have also injected the extract of pancreas in cases of diabetes, with temporary good results.

Spermine is the name of another fluid extract derived from Brown-Séquard's testicular juice, its action seems to be similar to the testicular juice, acting upon the motor areas of the cerebro-spinal axis, increasing the strength of the arms and legs, regulating the sexual, urinary, and digestive functions, and in improvement of the general sensibility.

American experimenters have not been idle during the rise of this *fin de siècle* therapeutics. There are now houses in New York manufacturing animal extracts known as cerebrine, medulline, testiculine, musculine, and other newly-coined-word remedies which have been recommended in the various diseases of the human body. Personally, the writer has had experience with cerebrine only, and, if he has noticed any results, they have been but temporary. Perhaps they do not even deserve the name "result," only a reaction had set in. Those of the writer's friends who have had experience with these remedies have also obtained negative results. The injection of water and glycerine has succeeded in accomplishing exactly what the animal extracts have done.

What the outcome of this innovation will be, or where it will end, is at present impossible to say. The field is so broad and the inclination to experiment so great that, in all probability, some little time will elapse before the returns will all be in. Whether these extracts exert any specific action, or whether the results thus obtained have been through "suggestion" and auto-suggestion, is likewise hard to explain, the writer is inclined to the latter view, that "suggestion" has been the "specific" agent.

NOTES ON ARSENIC.

BY JAS. LEWIS HOWE, POLYTECHNIC SOCIETY, LOUISVILLE, KY.

NOTWITHSTANDING the well recognized danger of arsenical greens as coloring materials, their use is still far too common, especially in green enameled papers for covering boxes and for more reprehensible purposes. I cite two cases in point.

1. Some time since my attention was called to some so-called "Kiss Candies" for sale in a little variety shop, largely patronized by the children of a neighboring public school. These candies were squares of caramel, etc., each wrapped up with a verse of poetry (?) in a piece of colored paper, together with other candies not wrapped. Some of these papers were colored with anilin dyes, but a very considerable number were green enameled papers. An examination of several of these latter revealed the following: —

Paper I. Bright-green surface, 50 square centimetres, arsenic found (estimated as arsenious oxid), 0.0285 of a gram.

Paper II. Light-green surface, 50 square centimetres, arsenic found, 0.0062 of a gram.

Paper III. Dark-green surface, 50 square centimetres, arsenic found, 0 0093 of a gram.

Paper IV. Bluish-green surface, 47 square centimetres, arsenic found, 0.0209 of a gram.

In the latter cases the enameled surfaces appeared much abraded, doubtless by contact with the other candies.

It is needless to say that here was not only a grave danger of the surfaces of the candies containing considerable arsenic, but the well-known habit of young children of putting everything bright colored in the mouth, might have easily resulted in taking a toxic dose.

2. Very recently there has appeared in the market a natural leaf twist chewing tobacco, wrapped around with a strip of green enameled paper three-fourths of an inch wide and about six inches long, fastened to the tobacco by a tack. The surface of this paper is an arsenic green. An examination was made of the twist by cutting off the exterior and using Reinsche's test. Distinct traces of arsenic were found. The quantity from a single twist was far too small to be dangerous, but it is needless to say that the practice of using arsenic paper under such circumstances should be condemned, and the manufacturers of the twist were cautioned on the point. The arsenic found in the tobacco doubtless came, by abrasion, from the paper wrapped around it, but there is another possibility. It is more or less widely known that Paris-green is used by tobacco-growers against the tobacco worm. While in general, when properly used, probably no danger is to be apprehended, it has occurred in my knowledge that tobacco has been sprayed very shortly before gathering. This would seem to be dangerous, and investigations upon this point are being now carried out.

As regards the detection of arsenic in medico-legal cases, attention has been called by Dr. Bernard Dyer in the Proceedings of the Chemical Society[1] to the fact that in certain cases, at least, a large proportion of the arsenic is precipitated upon the zinc in Marsh's test. The following is an observation in point. Arsenic was recovered in a certain case by Reinsche's test on six pieces of copper foil, each 20 square centimetres surface. Three of the pieces were divided, and from each the arsenic was sublimed in well-defined crystals, which could be identified without difficulty. From the other three pieces all the arsenic was sublimed, dissolved, and submitted to Marsh's test. Only the very slightest trace of a mirror was found, not enough to identify it as arsenic in a doubtful case. In this case, as in that of Dr. Dyer, cast zinc was used.

[1] Proc. Chem. Soc., 1893, p. 120.

Another recent case illustrates the necessity of the physicians who perform the autopsy preserving other organs than the stomach. G. had given her husband coffee from a pot in which she had emptied probably a whole box of Rough on Rats. He drank two cups, containing probably in the neighborhood of 7 grams. The coffee left, which I afterwards examined, was practically a saturated solution of arsenious oxid. Death ensued in four hours. The stomach was brought me, and was found to be empty, and much inflamed. Using the whole stomach, but a very small quantity of arsenic was found, evidently only what the walls of the stomach as a tissue could absorb, and far from enough to have produced death. The corroborative testimony was, however, sufficient to secure the woman's conviction.

Brodie's statement that when arsenic is taken in solution no trace of it will be found in the stomach is too broad, but it is imperative that in such cases other organs, notably the liver (as well as spleen and kidneys), should be preserved for analysis.

In my own experience, Reinsche's test, when carefully carried out, is far more satisfactory and no less certain in testing for the presence of arsenic than Marsh's. It can be readily learned by medical students and used practically by the physician, which is not true of Marsh's test. In order to secure well-defined arsenic crystals in Reinsche's test with a minimum of arsenic, I have found it desirable to use electrolytic foil, to roll the strip very closely, and to sublime in a tube of the smallest possible diameter.

A NEW IDEA IN MICROSCOPE CONSTRUCTION.

BY C. W. WOODWORTH, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

EVERYONE who has worked with the microscope, especially in studying rather large objects with medium and low powers, has felt the need of a better means of orientation than those at present available.

Stage forceps admit of complete rotation in one direction and some degree of motion at right-angles to this by raising or lowering the object and readjusting the focus. Ordinarily, any change in the direction of the object requires this readjustment of the focus, and generally the part to be studied is out of the field and must be found as well.

The ideal condition would be to rotate the object at the exact focal point of the microscope, and one can readily see that this could be attained if the object was supported by an apparatus revolving upon two axes at right-angles to each other, which intersect at the focal point, provided neither of these remains fixidly coincident with the optical axis.

There are many ways by which this condition might be attained, but perhaps as simple a modification of an existing stand as could be made with this object in view is a stand I have recently had the Bausch & Lomb Optical Company make for the Entomological Department of the University of California.

The instrument is a "Model" stand with an ordinary revolving mechanical stage. This is supported on a rotating bar, resembling the usual sub stage bar, and provided with a rack and pinion adjustment.

The stage is centred in the usual way, which brings the axis of revolution coincident with the optical axis. The stage bar swings upon a core which is adjustable laterally, so it becomes possible to make the axis of its rotation intersect the optical axis.

These adjustments being made, the instrument fulfils the conditions specified above whenever the focal point is brought to the axis of rotation of the stage bar. Consequently, in using the instrument the tube is brought to a certain position and the focusing of the object accomplished by means of the rack and pinion of the stage bar. The correct position of the tube is determined by trial for each objective, and marks made on the tube to indicate this position.

Different objectives, as those who have used revolving stages must have noticed, have somewhat different optical axes, and there is enough variation with the medium powers to make a centreing nose-piece essential.

While it is mechanically impossible to make all these adjustments perfectly correct, still I find that even with medium powers the object remains in the field during orientation, and that the

fine adjustment is generally sufficient to keep it constantly in focus, and I have no doubt that it might be adjusted well enough to use satisfactorily as high a power as a long-focussed quarter-inch objective.

Indeed, the instrument has proven to be all that could have been expected of it as an orienting microscope, and, at the same time, its value for ordinary work is is no way decreased, unless the slightly less rigidity of the stage is an objection.

Plans have already been completed for a dissecting microscope for use in my laboratory embodying the same principal but involving greater changes from instruments now in use. The new stand will consist of a stage which remains horizontal, so that insects may be dissected on it under water. The arm is jointed and the lower section bent so that the axes of the two hinges are at right-angles to each other. There will be the necessary arrangements for so adjusting these axes as to make them intersect, and the tube will be fitted with a nose-piece adjustment.

The base will be clamped to the desk for sake of rigidity. The focussing will be all done at the stage, though the tube will move to accommodate the varying focal-lengths of the objectives.

It is expected to use the objective under water, providing it with a hard-rubber shield having a cover-glass on the end. This kind of instrument should be also very useful for the study of aquatic forms.

SUMMER WORK IN MARINE ZOÖLOGY AT NEWPORT.

BY W. E. CASTLE.

OUT on the extreme southwestern point of the Island of Rhode Island, in Narragansett Bay, is Castle Hill, the comfortable residence of Mr. Alexander Agassiz. Against this point the waves of the Atlantic break with full force as they sweep round the east end of Long Island past Point Judith. This is the one rough spot in the trip from New York to Boston by boat.

As the tide comes in at Castle Hill and passes the narrow entrance of the bay, it makes a bend and carries its rich pelagic life into a little cove on the north side of the point. On this cove is Mr. Agassiz's laboratory.

It is a modest-looking little structure, modelled after a Swiss cottage, but within it is a very paradise for the marine zoölogist.

Aquaria, tanks, and glassware it contains in abundance, while fresh and salt water are carried in pipes to all parts of the laboratory. Fresh, salt water, and air to aërate the aquaria are pumped in by a wind-mill.

Mr. Agassiz carries on his own investigations in the smaller room at the west end of the building. The larger room of the ground floor each summer he generously puts at the disposal of a certain number of students from the Museum of Comparative Zoölogy at Cambridge, Mass.

Any day through the summer you may see half a dozen men here industriously bending over their microscopes, studying animals in their living form or preserving material for future study. On account of the extreme moisture of the atmosphere, little balsam mounting or clearing can be done at the sea-shore, so that work of this kind is usually postponed to be done at Cambridge during the fall and winter months.

Each morning at nine o'clock a hack from the boarding-house in town puts the men down at the laboratory door. It calls for them again at five, after their day's work is ended.

About ten o'clock each evening "Thomas," Mr. Agassiz's faithful man-of-all-work, rows slowly up and down the cove skimming the surface of the water with a tow-net. From time to time he lifts the net of fine cheese-cloth carefully from the water, turns it inside out and dips it repeatedly in a bucket of water.

The soup thus obtained is carried into the laboratory, diluted, and poured out into half a dozen glass dishes placed on black tiles.

Around these dishes the men gather upon their arrival in the morning, each furnished with pipettes and watch-glasses of various sizes. Every nook and corner of the dish is carefully scanned with naked eye and with the aid of lens, and in different lights, that no egg or larva, however minute, may escape notice.

After a man has acquired a general knowledge of the pelagic fauna, he usually confines his attentions to some particular group of animals, and the tow is sorted out and divided accordingly.

One man studies the mollusks, another the echinoderms, another the jelly-fishes, and so forth.

The tow is the chief source of material for study. It is supplemented, however, by dredging from the steam-launch, and shore collections at low tide.

The laboratory contains a good library of general works of reference, while literature on special topics is supplied from Mr. Agassiz's private library and from the museum library at Cambridge.

Not least among the advantages afforded to the training investigator are the helpful suggestions of Mr. Agassiz himself, whose long experience in marine work makes him an invaluable adviser.

With such excellent opportunities for advanced work in zoölogy, it is not surprising that in this little laboratory material has been gathered for many scientific papers of a high order, and that here many of the best zoölogists Harvard College has produced have received an important part of their professional training.

BACTERIOLOGY IN THE DAIRY.

BY C. C. GEORGESON, MANHATTAN, KANSAS.

THE bacteria which affect the quality of our dairy products may, for practical purposes, be classed under two heads, namely, those which are beneficial, and those which are injurious, and it is as essential to encourage the one as it is to wage a constant war upon the other. It has been established beyond a peradventure that the pleasant flavor and aroma of good butter are developed by certain species of bacteria present in the cream and instrumental in producing the changes which take place during the process of fermentation usually termed "souring." And it is equally well established that there are certain other species which, if permitted to get the mastery, will, as it were, overpower and neutralize the influences of the former class and give a disagreeable taste and smell to the butter. Both classes are present in all dairies, and the skill and success of the butter-maker depend in large degree on the recognition of this fact and his ability to foster the growth of the beneficial bacteria and to keep the injurious kinds in subjection. His chief weapon against the latter is cleanliness. Filth of every description is their best breeding-ground. But it also happens that the conditions are such, in surrroundings over which the butter-maker has no control, that, in spite of the strictest cleanliness on his part, the injurious organisms propagate too fast and deteriorate his products. Again, it may lie in the health, feed, or other conditions affecting the cows from which the milk is drawn. Under such conditions, what is he to do? It is the solving of this problem which has brought bacteriology into intimate connection with the dairy business; and the honor of solving it and thereby ensuring the production of "gilt-edge" butter under naturally adverse conditions belongs to the Danes.

In practical dairying there are two forms of physical means by which the growth of bacteria may be controlled, namely, cold and heat, relatively speaking. At a temperature at or near the freezing-point the active growth of the bacteria ceases, and hence the reason for keeping the milk cool by the use of ice. The cold produced by the ice does not kill the organisms or purify the milk, it simply retards their multiplication, and thus affords time for the dairy operations to take place before they work injurious changes. Heat, on the other hand, kills the bacteria. At the boiling-point nearly all those forms ordinarily found in milk are destroyed. But, as this high temperature affects the taste of the milk or cream by imparting the characteristic "boiled taste," in practice the temperature is raised to but 75° or 80° C., at which point the taste is not materially affected, and still the greater portion of the bacteria are killed.

This much known, the Danes have gone a step farther. They have isolated and perpetuated "pure cultures" of those forms which they have found to be beneficial to the production of first-class butter, and by impregnating the cream, under proper conditions, with these artificially grown bacteria they give their butter the desired flavor and aroma. It is now between two and three

years since the more advanced creamery owners began to practise this method, and the results have been so uniformly satisfactory that it is adopted in all creameries, when the ordinary methods fail to bring out the desired quality. The creamery owners were not slow to take advantage of this new discovery when they found that it afforded the butter-maker genuine and valuable practical aid. The honor of introducing this important improvement in dairy processes does not belong to any one man. Several scientists isolated and successfully prepared cultures for use independently of each other; though doubtless Professor V. Storch of the Experimental Laboratory, Copenhagen, deserves the lion's share of the credit. He has investigated the subject for some years, and published several important papers on the results of his researches. There are now three or four laboratories from which the prepared cultures are offered for sale to the dairies. They keep their processes secret, each following its own methods, the result of which is that their cultures differ, both in kinds of bacteria and method of treatment. This has brought out the fact that the beneficial species, as indeed also the injurious ones, are quite numerous, and that certain forms coöperate in the production of aroma and flavor, but that it is by no means necessary that a large variety should be present. Thus Mr. E. A. Quist of Skanderborg, Denmark, a young bacteriologist who has become deservedly famous for his successful work in this line, uses but two forms, which singly are ineffective, but together produce a very superior quality of butter.

The "secrets" in this work are, of course, far from impenetrable. They are confined chiefly to the composition of the nutritive fluid in which each laboratory has found it most expedient to propagate the bacteria employed, and this can, of course, be ascertained by experiment.

The value of "pure cultures" has been proven by practical experience. It remains to acquaint our dairy workers with the facts, and for our bacteriologists to take the work in hand. It offers a wide field for fruitful investigation.

INDIAN PAINTINGS IN SOUTHERN CALIFORNIA.

BY DAVID P. BARROWS, POMONA COLLEGE, CLAREMONT, CAL.

The Indian tribes which sixty years ago filled every valley of California have now either entirely disappeared or are represented by mere handfulls of descendants. These tribes left quantities of implements of their daily life to attest their vast numbers and certain remains through which can be traced their beliefs and customs.

An interesting study are their "picture rocks." These are found in many places throughout the coast and some of them have been examined and described.

In several localities in Southern California there are painted rocks to which, we believe, attention has not been called.

In the Perris valley, among the stony hills west of the town, are three rocks from twelve to twenty feet high which are covered, each on one side, with Indian paintings. There is evidence that this hillside at one time was the camping ground of a large number of Indians. About each spring the flat bowlders are filled with holes in which acorns and seeds were pounded, and pestles and *metates* are numerous. Bits of pottery, a portion of a grass basket and a few arrow points have also been found here. Twenty-five miles away on the opposite side of the San Jacinto plains there is now the small village Saboba, of the Serrano Indians.

On the Radec Creek thirty miles east of Temecula is an interesting case of rock painting. A hundred feet above the stream on the hillside there is a small cave formed by huge bowlders piled together. It is evident that the front of this cave was once walled up with brush, stones and earth and that it was used for a *temescal* or sweat house. The cold stream is at hand into which the patients, dripping with perspiration could plunge. The inside of this cave is painted with the same designs and colors as the Perris rocks. A flat rock inside is filled with holes in which it appears that the minerals for making the paints were ground. Digging down a few inches, into the loose soil of the floor, brought up broken pottery, charcoal and ashes, and bits of small bones. The interior of the cave is blackened with the smoke of the fires.

This cave is a quarter of a mile from the site of an abandoned village, which the Indians say was called Sequala. Relics, including a number of arrow points more perfect than are usually obtained in Southern California are here found. In the Strawberry valley in the San Jacinto Mountains there are four more of these painted rocks. The Cahvilla Indians still visit this valley for acorns and piñones.

Doubtless search and inquiry will reveal much more similar work. The designs, which in all cases are much the same, consist mainly of wavy and angular lines, diamonds, and geometrical patterns and figures formed by dots. The print of the open hand is occasionally seen.

There is little remarkable in these paintings unless it be the absense of *pictures*, and the fact that the same designs were adhered to not only by different tribes but by tribes of different stocks, showing that the established forms were wide spread and rigidly followed.

The colors used are red, black and white. They are made from mineral earths found in the mountains around, which are ground, mixed to the consistency of paste, and applied.

The most striking fact in regard to these paintings is this: Among the Cahvilla Indians whose home is in the San Jacinto Mountains, twenty miles from Radec Creek and eighteen from Strawberry valley in the opposite direction, there are two old men, and now only two, who at some feasts perform a remarkable war dance. The dancer is stripped to his breech clout and then girt with a kilt of beautiful brown eagle feathers, and his head is covered with a feathered war bonnet. His face and body are then painted with the same designs and colors which we have noticed. The same mud paints are used and sometimes the hand is daubed and its print struck upon the dancer's broad shoulders, precisely as it appears upon the Perris Rocks. Thus dressed and painted the old warrior proceeds to execute a dance which we venture to say is one of the most wonderful among the strange dances of the North American Indians; a dance which makes the old women shout and cry in excited remembrance, and infirm old braves wave their arms and join in the wild song.

There must be significance in these designs so carefully followed and preserved.

The writer and others are arranging for fuller examination of the rock paintings of Southern California with a view to publication. This note is intended simply to call attention to the double use of these designs upon the rocks and in the dance body-painting.

NOTES AND NEWS.

THE sixth annual meeting of the American Economic Association will be held in Chicago, September 11–15, 1893, in one of the assembly halls of the University of Chicago. It is expected that the general headquarters of the association will be at the university, which has not only permitted the use of one of its halls for the assembly to meet in, but also offers rooms in its dormitories at a moderate rent by the day or week to persons attending such conventions. Two meetings of the council of the association will be held during the session, and the programme as announced includes, besides the annual address by the President, Professor Charles F. Dunbar, the following papers: The Value of Money, by Francis A. Walker; The Relation between Interest and Profits, by Arthur T. Hadley; The Scope of Political Economy, by Simon N. Patten; The Genesis of Capital, by J. B. Clark; The Wages Fund at the Hands of the German Economists, by F. W. Taussig, and Marshall's Theory of Quasi-Rent, by E. R. A. Seligman. Several other societies dealing more or less with economic questions, including the International Statistical Institute, the American Statistical Society, the Social Science Congress and the Labor Congress, are to meet at Chicago at about the same time as the American Economic Association, and, as arrangements have been made to have the scientific sessions of these various societies held at different times, a rare opportunity is presented for the students of economic and social subjects to meet their co-laborers of this and other lands.

SCIENCE:

PUBLISHED BY N. D. C. HODGES, 874 BROADWAY, NEW YORK.

SUBSCRIPTIONS TO ANY PART OF THE WORLD, $3.50 A YEAR.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

NOTES ON THE OCCURRENCE AND DISTRIBUTION OF UREDINEÆ.

BY M. A. CARLETON, KANSAS AGRICULTURAL EXPERIMENT STATION, MANHATTAN, KANSAS.

VERY little attention has been given to the distribution of parasitic fungi, except so far as to note their occurrence on host-plants of more or less close relationship, and that they are usually somewhat more abundant in wet seasons and places than in those that are dry. But close observation reveals more facts than these, and some that are peculiarly interesting.

Strictly speaking, the parasitic fungi are affected by but two of the elements of environment concerned in the distribution of phanerogams. These are *temperature* and *moisture*, while flowering plants are also affected by differences in kind of *soil* and amount of *light*.

However, there is a kind of distribution of parasitic fungi, scarcely to be called geographical, although such distribution has probably been caused by changes in the anatomy and physiology of the host, which changes were themselves caused by variations in soil and climate. I refer to cases of certain hosts which support certain fungi in one locality and not in another. Of course, it may be said that in one or more of these localities there has yet been no chance for infection, but in numerous cases this is, to say the least, rather improbable, and sometimes the hosts are distributed so as to completely connect these localities, and yet without general distribution of the fungi. Moreover, some of these hosts are annuals, or occasionally biennials, so that it cannot be said that the fungi are prevented from spreading by the circumstance of their being reproduced yearly from perennial mycelium and not by infection by germinating spores.

Again, while a group of species (a genus, for instance) in one locality may all be attacked by a certain fungus, in another locality, where these hosts are all represented, only a part of the group may be affected by the same fungus.

Certain fungi have also peculiarities of occurrence in point of time. After being reproduced annually for several years, they may suddenly disappear for an indefinite period, or reappear after certain intervals of time.

In illustration of these general statements, it may be of interest to give here some observations that I have made on the distribution of Uredineæ in Kansas, covering a period of about six years.

In the first place, it seems to be true that *Aecidia* require more moisture than the other stages, and *telentospores* the least. In Kansas, east of the 96th meridian, the species of *Aecidia* number about fifty, and *telentospores* (of all genera) sixty-five; while west of the same meridian the proportion is about twenty-three of the former to fifty of the latter. The telentospores of western Kansas, it is seen, are more than twice the Aecidia. The difference in rainfall of the two portions is well known. But all Uredineæ are probably more abundant in wet seasons than in dry seasons, and also more abundant in warm seasons than in cool seasons. This season has been much earlier than the preceding one, and has been marked by a number of unusually hot days, alternating with heavy rains. Moreover, the rains have continued to date, and were quite frequent just at harvest time. The result has been a season unusually favorable for rusts. The following species have been collected in large quantities this season: *Aecidium peckii*., De Toni, on *Oenothera biennis; Aecidium euphorbiæ*, Gmel.; *Aecidium violæ*, Schum., on *Viola falmota*, L., var. *cucullata*, Gr., and cultivated pansies; *Aecidium zanthoxyli*, Pk.; *Aecidium cepholanthi*, Pk.; *Puccinia graminis*, Pers. II.; *Uropyxis petalostemonis* (Farl.), De Toni; *Roestelia pirata*, Thaxt., on *Pirus coronaria; Uredo cæoma-nitens*, Schwein., on *Rubus villosus* (cult.) and *Rubus canadensis*. Immense numbers of spermogonia were found with *Aecidium peckii*, De Toni, and with the *Uropyxis, Roestelia*, and *Uredo cæoma-nitens*, Schw., above mentioned. *Puccinia graminis*, Pers., has been quite destructive to grains, especially oats, over the greater part of the State, but particularly in the eastern portion. It is a very interesting fact that, while this species was quite rare last year, it is the predominating rust of grains this year, and has caused extensive damage. Last year *Puccinia coronota*, Corela, was very abundant on oats, but this year, in repeated examinations, I have been unable to find a single specimen. Even *P. rubigo-vera* (D. C.), Wint., the ever-present grain-rust, is very scarce this season.

The greatest damage from rust prior to this season that I recall was in 1877, when there was a severe rust scourge over northern Kansas. Many fields of wheat were entirely destroyed, and never harvested. Sulphur-like clouds of spores filled the air and irritated the nostrils of the workmen. I had no knowledge of botany then, but a vivid remembrance of the general appearance of the rust, coupled with my present knowledge of the differences between the species, inclines me to believe that it was *Puccinia graminis*, Pers., that did the damage. I have always doubted the usual statements that *P. rubigo-verà* is the rust that usually does the damage in this country, and this season the facts in Kansas strongly confirm my opinion. Of course, the last-named rust is the more common from year to year, but seldom attacks the stem to any great extent, and, in my own experience, any amount of it on the leaves usually does little damage, but when the stem becomes covered with red powder and finally weakens and falls, and the grain shrivels, and the straw becomes very light, then you may guess that *Puccinia graminis* is in the field. However, there may be facts from other portions of the country, even this season, that furnish contrary evidence, for aught I know.

The above facts call up further instances of variations in the occurrence of species. The following species, originally known in Kansas, have not, to my knowledge, been reported for several years: *Aecidium abundans*, Pk.; *Aecidium cassiæ*, E. and K.; *Aecidium sambuci*, Schw.; *Puccinia similacis*, Schw.; and *Aecidium macrosporum*, Pk. During the succession of recent dry seasons they have probably become so reduced in numbers that finally there were not enough healthy spores left to reproduce the species on the following year. In like manner *Puccinia solida*, Schw.; *P. seymeriæ*, Burrill; *P. saniculæ*, Grev.; and *Aecidium punctatum*, Pers., seem to have disappeared. In future wet seasons infection may take place from a distance, and the fungi reappear.

As to migration, *Aecidium tuberculatum*, E. and K., has certainly been coming rapidly eastward, until this season it was found at Manhattan for the first time. *Uredo gaurina*, Pk., seems also to be coming eastward. *Puccinia heterospora*, B. and C., with its host (*Abutilon avicennæ*), *Puccinia xanthii*, Schw., var. *Ambrosiæ*, Burrill, several varieties of *Aecidium compositarum*, Mont., and *Puccinia microsperma*, B. and C., are, without much doubt, working westward. Others might be mentioned, but the possibility of their having been present for years already, and overlooked, forbids that we should place much dependence on such observations.

But a more remarkable phase of distribution is found in the fact that a number of species known on certain host-plants in western Kansas for a number of years are entirely absent in the

eastern portion of the State from the same host plants, although the hosts themselves are very abundant in some cases. *Grindelia squarrosa*, Dund., ranges over the entire State in abundance, but *Puccinia grindeliæ*, Pk., has never, to my knowledge, been found east of Russell and Rooks Counties. Another singular fact is that I never found it on the variety *grandiflora*, Gr., which grows so abundantly in western Kansas. *Uredo gaurina*, Pk., and its *Aecidium*, too, are found in the western counties only, although three species of *Gaura* are native in eastern Kansas. *Lygodesmia juncea*, though not widely diffused in the eastern portion of the State, is still rather abundant in spots about Manhattan, but without any fungus; while over the western counties, not only is the plant itself very common, but it supports, in great abundance, a rust which has been named *Puccinia variolans*, Hark., var. *caulicola*, Ell. and Ev. I have noticed for several years that *Puccinia phragmitis* (Schum.), Korn., is never found on *Phragmites communis* in eastern Kansas (although abundant on *Spartina cynosuroides*), but is common on this host wherever found in the western counties, so *Uropyxis amorphæ* (Curt.), Schroet, abundant on both *Amorpha canescens* and *A. fruticosa* in the west, is found only on the former host in this region. What seems to be the *Puccinia grindeliæ*, Pk., above mentioned, is also found on *Aplopappus rubiginosus* in abundance in the west, but this host does not grow in this region. In these cases may there not be anatomical differences in the hosts (of the same species, even) which cause this peculiar distribution of their parasites. At least, the question is worthy of close investigation. It is another indication, to me, that plant *pathology* cannot be well understood without a knowledge of plant *physiology*. I have already shown in another article[1] how the host-plants themselves vary in passing from the more fertile to the more barren districts of the great plains. The distribution of their parasites may be greatly influenced by these variations.

IN MEMORIAM. — THE REV. W. C. LUKIS, M.A., F.S.A.

BY W. GREGSON, F.G.S., BALDERSBY, S. O., YORKSHIRE, ENG.

The death of the Rev. William Collings Lukis removes a familiar figure from the ranks of British scientists, and one who will long be remembered with feelings of deepest respect and esteem, not only in Great Britain, where he lived and worked so long, but throughout the whole of the scientific world. His tall, erect, manly form, and genial countenance, were well known throughout Yorkshire, and he was certainly one whose friendship it was a pleasure and a delight to claim.

Mr. Lukis was not only an archæologist of world-wide eminence but was also a considerable authority on geology, botany and other branches of natural science. He had long been an observant traveller in various parts of Europe, Africa, America, etc. More especially in the Netherlands, Denmark, France, Italy, and Algeria; and his writings and researches show that accurate and intimate knowledge of those countries which he acquired from careful personal investigations. The deceased gentleman was also an artist of considerable power and merit, as many of his works, illustrated by his own hand, sufficiently testify. He was born on April 8th, 1817, in the Island of Guernsey (English Channel), and was the third son of Colonel Frederick Corben Lukis, by Elizabeth, youngest daughter of Mr. John Collings of Guernsey. From his father, who was also an archæologist of distinction, Mr. Lukis inherited a taste for natural science, which he pursued at the University of Cambridge, under Professors Henslow and Sedgwick, and the writer has frequently heard him dilate on the benefits he derived from his connection with such far-famed scientists. He received his early education in Guernsey, afterwards in France, and at Blackheath, near London, under the mastership of the Rev. Sanderson Tennant, whilst in January, 1840, he graduated in honors at Trinity College, Cambridge. Twelve months later he was ordained at Salisbury, by Bishop Denison, and licensed to the curacy of Bradford-on-Avon (of which parish the late famous Harvey, formerly private tutor to Prince George, now Duke of Cambridge, was then vicar). In 1845, he was appointed chaplain to the Marquis of Ailesbury, who successively presented to him the livings of Great Bedwyn, and Collingbowne Ducis in Wiltshire, and Wath, near Ripon, in Yorkshire; which latter he held for thirty-one years up till the time of his death. Whilst residing at Cambridge he was one of the earliest members of and contributors to the Camden Society, then newly formed, and when living at Bradford-on-Avon, he published a quarto volume on "Ancient Church Plate," also other works on "Church Bells," "Church Towers," etc.

In 1847 he was elected a Fellow of the Royal Society of Northern Antiquaries, Copenhagen; in 1853, a Fellow of the Society of Antiquaries, of London; and in 1867, a member of the Société Archéologique de Nantes, whilst in 1872, he was elected a corresponding member of the Société de Climatologie Algerienne. Mr. Lukis was the author of many works on barrows, and other prehistoric monuments, and was a practical barrow digger on an extensive scale, in various parts of England, France, Denmark, the Netherlands, and elsewhere. The Society of Antiquaries, London, published his scale plans of Rude Stone Monuments, with descriptive text. He also edited, for the Surtees Society, Dr. William Stukeley's Diaries and Letters, published in three volumes; and when the Ripon Millenary Festival was celebrated, in 1886, he was an active member of the committee, which was formed to carry out the arrangements, and wrote an interesting and valuable article entitled "Ancient Ripon," since included in Mr. W. Harrison's "Millenary Record" (a beautifully illustrated volume published at Ripon, in 1892).

Mr. Lukis, who was a prominent Free Mason, and a J.P. for Wiltshire, married Lucy Adelaide, daughter of Admiral Sir Thomas Fellowes, who survives her husband, and by whom he leaves two sons and four daughters; the eldest daughter being the wife of a son of the late Canon Hawkins, J.P., of Topcliffe, Yorks (a relative of Mr. Justice Hawkins), and the second daughter being the wife of Mr. H. C. Bickersteth (son of the late Bishop of Ripon, nephew of the Bishop of Exeter, and cousin of the Bishop of Japan).

A committee has recently been formed, under the chairmanship of Sir Reginald Graham, Bart., of Norton-Conyers, near Ripon (which is close to Wath, and where the talented authoress of "Jane Eyre" at one time resided), for the purpose of placing in Wath Parish church a strained-glass window, as a lasting memorial of the late much esteemed rector, who was so ripe a scholar, so kind a friend, and of whom it may be truly recorded: —

> He seemed the thing he was, and joined
> Each office of the social hour
> To noble manners, as the flower
> And native growth of noble mind.

OBSERVATIONS ON DUCKLINGS.

BY C. LLOYD MORGAN, BRISTOL, ENGLAND.

OF seven eggs transferred from a hen to my incubator only two hatched out. Of the others four had not been fertilized and the fifth contained a dead bird in about its tenth day of incubation. Several hours before the ducklings chipped the shell they were piping to be free. One (A) was hatched four hours before the other (B). They were left in the drawer of the incubator for about 20 to 24 hours, and were then transferred to an experimental poultry yard in my study. Somewhat unsteady upon their legs, they kept tilting backwards on to their tails; but A was decidedly the stronger of the two and his motor coördination was better. They pecked with uncertain aim at anything which caught their eyes, such as marks on the basket in which they were to sleep, grain, sand. Chopped-up white of egg was placed before them and moved about with a long pin to draw their attention to it. The coördination for pecking was far from perfect. When a piece was seized after several shots it was mumbled rapidly and then shaken out of the bill unswallowed. A shallow tin of water was placed before them. They took no heed of it. As they tottered about they walked through it several times, but no notice was taken. I dipped A's beak into the water. He drank with characteristic action; he then pecked at

[1] "Contrib. U. S. Nat. Herb.," vol. XXI., No. 6, pp, 220-232.

the water repeatedly and drank. Presently B imitated him, and he too drank repeatedly. Both pecked at white of egg held in forceps, seizing at about the third shot, but shook it out of the bill. Perhaps some was swallowed. I then put them to bed in their basket.

Two hours later they were taken out and waddled about with more accuracy of motor coördination. When they came to the water they both at once drank. They pecked at white of egg placed on a black tray to make it more conspicuous, but shook it out of their bills.

After another two hours A was dropped into a fairly deep bath. He floated and kicked vigorously, dropping excrement. In less than a minute he swam round and round the bath and pecked at marks on the side.

A little later both made for the tin of water and sat in it. They pecked with more accuracy and without suggestion (i. e., moving it about with pin) at white of egg on the tray, still shaking the head vigorously, but swallowing freely. A scratched his head two or three times, but tumbled over in the process.

Later in the evening of the same day they ate white of egg freely. The pecking coördination was much more accurate, but not quite accurate. I placed B in the bath. He kicked excitedly and dropped excrement; then swam about vigorously, pecking at the sides.

Next morning when taken from their basket both A and B made for the water in their tin and drank and sat in it. They ate keenly of white of egg, swallowing large morsels. Both scratched their heads occasionally, tumbling down. Both preened their down, rubbing their bills over their breasts. They applied their bills to the base of the tail and rubbed their heads along their backs in the most approved duck fashion. They stood up and clapped their downy winglets, toppling over backwards on to their tails from imperfect coördination.

In the middle of the day I placed a blue-bottle fly, from which the wings had been snipped off, near them. A followed, pecking at it, but failed to seize. It escaped under the newspaper which formed the floor of my yard. I routed it out. A again followed pecking, but the fly escaped through the wire netting. I placed it again in the yard. A followed and caught it at the third peck, swallowing it apparently with satisfaction. Put A in the basket. B then caught another fly after numerous abortive attempts.

Both A and B ate their own excrement and that of chicks, showing less signs of dislike than do chicks.

Tried the ducks with all sorts of odd things, bits of paper, chopped-up matches, leaves, flowers, small stones, red currants, anything of suitable size I could lay hands on. Each was seized and mumbled, and then either rejected or swallowed.

When three days old I threw to them the yellow and black-banded caterpillar of the cinnabar moth. Each seized it, but dropped it at once. Very soon no notice was taken of it. Next day on repeating the experiment A seized a caterpillar, but dropped it. B took no notice. They ate freely of green caterpillars from gooseberry bushes, and distinguished between these nice morsels and the nasty yellow and black caterpillars. They ate tadpoles placed in their water, noticing them directly they began to swim about.

I daily placed for them at about 9 A.M. in my experimental yard a large black tray with a shallow tin of water. To this they at once ran and drank, sitting in the water and washing. On the sixth day I put down the tray and tin as usual; but the tin was empty. They ran to it, went through all the action of mumbling the water and drinking. They sat in the empty tin wagging their little tails and ducking down their heads as if they were enjoying a good bath. They continued this procedure for about ten minutes. I then gave them some water. The next morning I repeated the same experiment, but though the ducks searched for water with their bills they did so with less vigor and zest.

A winged bee was thrown in. B seized it, but dropped it. A seized it, and after mumbling it for a moment, swallowed it. Possibly he was stung. He kept on scratching the base of his beak first on one side then on the other and seemed uneasy. But he was all right again in half an hour. There was no *instinctive* avoidance of bees. Subsequently he would not touch a bee. There was an *intelligent* avoidance of bees. Nor would they touch the bee-like fly, *Eristalis*. Its mimetic form served as a protective character.

Subsequently A seized a humblebee and after mumbling it in the water swallowed it and seemed none the worse.

The above jottings are extracted from my note-book and are given without comment. I may add that as compared with chicks the ducklings show less intelligence and develop psychically more slowly. Their greediness and vulgarity are painful to observe and to contemplate.

BACTERIA IN HEN'S EGGS.

BY MELVIN A. BRANNON, FORT WAYNE, IND.

THAT cider should turn to vinegar and milk become sour excites little wonder among common people or even individuals of considerable education. The mere statement of fact in such ordinary phenomena seems to satisfy the masses, but fortunately for scientific and sanitary interests, there is a class of individuals persistently questioning such phenomena till reasonable explanations are secured. Consequently the souring of cider and milk was found to be caused by the presence of organisms which produced acetic and lactic acids, respectively, whenever the proper medium was exposed in an atmosphere of moderate temperature.

Not only have these common but interesting phenomena, "souring" of cider and milk, been explained by the presence of bacteria, but many other phenomena, less common and more concealed, have been directly traced to the action of some form of bacteria associated with the matter in which the phenomena occurred.

Of course, no intelligent student holds bacteria responsible for every chemical change in organic matter, but it is well understood and universally admitted that the greater number of chemical changes in living and decaying organic material are induced by some bacterial form.

Recognizing the importance of recording every phenomenon relating to the presence and action of bacteria, it seemed proper to recite to readers of *Science* some of the details in a very peculiar case recently noted.

An acquaintance whose intelligence and acuteness of observation make his testimony thoroughly reliable, stated that one of his Plymouth Rock hens was laying eggs, every one of which had an unpleasant odor, although broken a few hours after it was laid. He also said that the hen was laying regularly and appeared healthy in every respect save that she had the gaps. A few days succeeding this statement he reported the fowl butchered and closely examined. In her craw was found a ball of threads pulled from manilla matting which she had access to. The ball entirely filled the craw and was very hard and compact, except in the central region, through which ran a cylindrical opening, affording a passage-way for the food. This ball of manilla threads and the craw gave the same offensive odor as did the eggs when broken. The heart, liver and digestive apparatus —excepting the craw—were normal in size and appearance.

A perfect egg was taken from the hen and personally examined. It looked and smelled like a perfectly fresh egg, but when broken it gave forth the same disgusting odor that had characterized her craw and previously laid eggs. This odor was exactly like that observed in decaying meat, and, had the broken egg been concealed, any person entering the laboratory would have suspected that decaying meat was exposed in that room.

The egg contents gave a strong alkaline reaction when tested with litmus paper. The general appearance of yolk and white was normal, but a portion of albumen mounted and carefully observed under the microscope, magnification 250 diameters, revealed the presence of a great number of bodies varying in shape from almost round to distinctly oblong. These forms closely resembled bacteria, but lack of time for tests and cultures made the determination of them impossible.

From these few observations and experiments it would be unscientific to definitely conclude that these eggs were decaying from the action of bacteria, but in view of the fact that the odor so closely simulated that of decaying flesh and that the egg con-

tents were strongly alkaline, which would favor the development of bacteria, is it not exceedingly probable that this fowl had clogged her craw and set a great culture of bacteria developing there, till at length bacteria had gained admission to the oviduct through the blood and thus developed infected eggs?

This rather brief description in no wise pretends to explain this phenomenon. It has been given with a dual hope: First, that some bacteriologist whose experience has familiarized him with similar cases may give the desired explanation of how these bacteria, if they were bacteria, gained admission to these fresh eggs; second, that the attention of physicians and officers of boards of health may be attracted to this subject.

There is evidently as much necessity for caution in feeding hens as in feeding milk cows or in fattening beeves and swine. Chickens should not be fed all sorts of refuse matter and then be expected to return therefor good healthy eggs and meat. Yet we all know the universal practice in small cities and villages, where many of the market fowls and eggs are obtained, is to give over the office of scavenger to the feathered inhabitants. If the subject were properly regarded by physicians and the people were rightly educated, we might look for better things; till then the occurrence of such peculiar phenomena as the one related and even more unique, should not surprise scientific students.

A MALAY FIRE-SYRINGE.

BY F. W. RUDLER, MUSEUM OF GEOLOGY, LONDON, ENGLAND.

BY the kindness of my friend Mr. Henry Louis, the well-known mining engineer, who has recently returned to England from Singapore, I have received a fire-syringe which he obtained towards the end of 1890 from a part of the Malay Peninsula never previously visited by a white man. So far as I can ascertain, the use of the fire-syringe has not been hitherto recorded from this locality. Mr. Walter Hough, in his admirable description of the fire-producing appliances in the United States National Museum, published in the Smithsonian Reports for 1888 and 1890, refers to the syringes of Borneo and Burma, but makes no reference to those of the Malay Peninsula. No syringe from this locality is to be found in the very extensive ethnographical collections in the British Museum. Moreover, Mr. A. R. Wallace does not know of its use by the Malays, nor is it known to Professor Terrien de Lacouperie, who has lately written on the production of fire by the Chinese in his *Babylonian and Oriental Record.*

Mr. Louis obtained the specimen in question from a Malay who stopped with a party of others at his camp on a small stream known as Ayer Katiah, one of the tributaries of the River Teluban, on the southeast coast of the Malay Peninsula, and about 100 miles from the mouth of the river. The district is sparsely inhabited by Malays, and the party from whom the syringe was obtained had come from some of the neighboring Kampongs. They squatted down and began smoking, one of the men lighting his cigarette in the most matter-of-fact way by means of his fire-syringe. There is no reason to suppose that he was singular or had imported his apparatus from a distance. If the rest of the party elicited sparks by means of quartz and iron it was, they admitted, simply because they preferred this method as being less troublesome and more trustworthy than that of compressing air.

The Malay syringe consists of a tube of hard wood 2½ inches long, closed at one end, towards which the tube slightly tapers. It is surrounded with neatly plaited strips of thin rattan which, while they ornament the object, serve also to strengthen it and prevent the wood from splitting longitudinally in the direction of the fibre. The piston is made of similar wood and is packed with string. The tinder was carried in the hollowed-out skin of a large bean, like the seed of *Entada.*

In order to use the instrument a small piece of dry tinder is placed in the slightly hollow end of the piston and pressed down to keep it well in place; the piston is then inserted in the cylinder, smitten sharply with the palm of the hand and very rapidly withdrawn, when the tinder becomes sufficiently heated to slightly smoulder, and by then gently blowing it a bright glow may be obtained. According to Mr. Louis, the native never seemed to fail in his use of the syringe, but the knack is not easy to acquire, and those who have employed a similar apparatus for demonstration at physical lectures know that it is far from easy, even with a well-made instrument, to ensure success.

Contrary to what might have been expected, it was rather a young man who preferred this strange mode of producing fire to the more convenient flint-and-steel method. There can be no doubt that the use of the fire-syringe, never widely spread, is rapidly dying out, and hence every fact bearing on the geographical distribution of so curious a custom deserves to be put on record.

L'ORIGINE DES ARYENS.

PAR LE PROF. G. DE LAPOUGE, UNIVERSITÉ DE MONTPELLIER, FRANCE.

LES revues scientifiques et *Science* en particulier ont publié cette année une quantité d'articles qui avaient la prétention d'éclaircir la question aryenne, mais qui me paraissent avoir surtout produit le résultat inverse. Il me semble que l'obscurité vient surtout de ce qu'on ne s'entend pas sur la valeur de mots qui, détournés de leur signification primitive, sont maintenant bien près de n'en avoir aucune, tant elle devient vague. Partisan très actif de l'origine européenne et occidentale de la race blonde et de son identification avec les premiers auteurs de la culture aryenne, j'ai contribué sans le vouloir à créer cette équivoque. Je voudrais arriver à la dissiper.

Le titre d'Aryens est historiquement applicable aux Indo-Iraniens seuls. Ceux-ci étaient loin de former la partie la plus pure, au double point de vue morphologique et sociologique, de la race que nous appelons aryenne. C'est pourquoi je crois préférable de laisser le terme d'Aryen à l'histoire et à l'ethnographie, et de lui conserver son sens strict, plutôt que de continuer à l'étendre comme on l'a fait, d'abord en philologie d'un sous-groupe à un groupe entier de populations parlant des langues apparentées et pratiquant des coutumes analogues, et ensuite en anthropologie à la race qui parait avoir joué chez ces peuples le rôle de ferment. En regardant comme démontré ce qui est encore discuté, à savoir que les langues et les idées aryennes sont nées dans une tribu ou dominait la race blonde et sous l'influence de son génie propre, faire remonter d'une partie des peuples conquis au premier noyau des conquérants un nom ethnique plus récent d'un nombre considérable de siècles, c'est à peu près comme si l'on voulait dans dix mille ans appeler les Francais d'aujourdhui Dahoméens, parceque l'Afrique serait en grande partie devenue, c'est une pure hypothèse, francaise de moeurs et d'institutions.

Il conviendrait de s'entendre pour adopter désormais dans le langage précis la terminologie suivante: Aryens, les Indo-Iraniens primitifs; langues aryennes, institutions aryennes, les langues et les institutions de ces peuples et de leurs descendants immédiats; Indo-Européens, les peuples, d'origine quelconque, qui ont fait usage de ces langues, et de ces institutions, mais à partir seulement du moment ou cet usage a commencé chez eux. La terminologie ainsi rétablie, on arrive à s'apercevoir que le problème aryen n'existe pas et qu'il y avait simplement logomachie. On se trouve en face des questions suivantes, aux quelles il est plus facile de répondre dès que l'esprit n'est plus tiraillé par les acceptions multiples et discordantes des termes.

Quel a été le berceau des langues et des institutions indo-européennes? Question d'histoire et de philologie, à laquelle on est actuellement porté à répondre: l'Europe.

Ces langues et ces institutions paraissent elles avoir été particulièrement propres à certains peuples caractérisés par la prédominance d'une race, et laquelle? Autre question d'histoire et de philologie à laquelle on est obligé de répondre: oui, la race dolichocéphale blonde. En effet il n'y a pas de peuple ou cette race domine qui fasse usage de langues ou d'institutions non-aryennes, tandis que les peuples ou cette race ne domine pas font en partie usage de langues ou d'institutions d'un autre groupe, en ont fait usage à une époque historique rapprochée (partie de la Russie et de l'Allemagne), ou paraissent en avoir fait usage dans l'antiquité (Gaule, Espagne).

L'évolution qui a produit ces langues et ces institutions a t'elle eu pour point de départ un peuple ou la race blonde avait la

supériorité soit numérique, soit sociale? et paraît elle le fruit du génie de la race? Question délicate, car il faut juger d'après des probabilités soulement, mais à laquelle il est permis de répondre oui.

Quel a été le berceau de la race dolichocéphale blonde? Question d'archéologie préhistorique et de physiologie. Réponse: c'est la région où le type ostéologique le plus voisin du type dolichocéphale blond s'est trouvé soumis aux conditions météorologiques nécessaires pour le réduire à un état voisin de l'albinisme.

Où doit etre localisé ce berceau? le type dolichocéphale blond se rattachant par le squelette aux races quaternaires et néolithiques de l'Europe occidentale son berceau ne peut être cherché qu'en Europe, les conditions nécessaires d'inactinisme et d'humidité permanente qui ont déterminé sa décoloration ne se sont trouvées réalisées que dans la région voisine de la Mer du Nord, à la fin du quaternaire, et mieux encore dans la partie de cette mer alors exondée.

On arrive ainsi aux propositions suivantes:—

Le type polichocéphale blond, *H. europœus*, Linné, abusivement appelé aryen, s'est développé dans le N. O. de l'Europe, telle quelle était à la fin des temps quaternaires, par l'action des milieux sur les races dolichocéphales indigènes, ou sur une seule de ces races. Il s'est fixé par un long séjour dans ces régions. Il en est sorti par des émigrations successives à mesure que le sol s'engloutissait sous ses pieds.

Les langues et les institutions indo-européennes se sont formées quelque part en Europe sous l'action du génie de la race blonde. Cette formation est de date relativement récente, et si les blonds ont apporté de leur primitive patrie une langue proto-aryenne, elle était à un stade d'évolution qui ne permettrait probablement pas d'en reconnaitre la nature. On sait la rapidité avec laquelle varient les langues non écrites. L'état des langues indo-européennes prouve d'autre part leur origine récente.

Les langues et les institutions indo-européennes ont été ensuite implantées dans les deux tiers de l'Europe et dans une petite partie de l'Asie, par les conquètes des peuples qui en faisaient usage. Un peuple passé probablement d'Europe en Bactriane par la mer Caspienne, ou Asiatique mais conquis par des Européens a porté les langues et les institutions indo-européennes dans l'Inde. A ce rameau seul appartient le nom d'Aryen.

Tout s'éclaircit donc dès qu'on n'embrasse plus ensemble la question d'origine des langues aryennes et celle de la race blonde, dès qu'on ne confond plus les peuples indo-européens avec les blonds, conquérants d'abord, puis absorbés et devenus classe dirigeante chez des peuples de race différente.

THE SCIENTIFIC ALLIANCE OF NEW YORK.

BY JOSEPH F. JAMES, M. SC., WASHINGTON, D.C.

THE "Scientific Alliance of New York" is composed of the following societies: New York Academy of Science, Torrey Botanical Club, New York Microscopical Society, Linnæan Society of New York, New York Mineralogical Club, New York Mathematical Society, New York Section of American Chemical Society.

Two meetings have been held, of which the proceedings have been published, and as the scheme seems to mark an era in scientific matters, especially in New York City, and as it is one that is likely to result in permanent benefits to science, a notice of it does not seem out of place.

The council of the Alliance is composed of the president and two members of each of the component societies. Its president is Charles F. Cox, and its secretary and treasurer N. L. Britton. The first meeting was held on November 15, 1892, and at it addresses were made by various prominent men. Hon. Seth Low, President of Columbia College, spoke upon the advantages to the city of New York of the Alliance, and he was followed by Mr. C. F. Cox with an address on the advantages of the alliance to the scientific societies. Mr. Cox pointed out the necessity of coöperation by the various organizations if the best results are to follow. He referred to the fact that the real materialists of the world are the so-called practical men, who measure scientific knowledge by commercial standards and in whose eyes science "is worth only what it will bring when offered in the form of dynamos, telephones, electric lights, dye stuffs, mining machinery and other merchantable wares." The object of the Alliance he held to be to furnish a sort of common ground (may we call it a clearing house?) where knowledge of what is being done in one society is conveyed to all the rest, and in this way all are kept posted in regard to what is going on and duplication of work is thereby avoided.

The third address was by Hon. Addison Brown on the need of endowment for research and publication. He referred to the example set by Professor Tyndall, who established three scholarships with $30,000 received by him from a series of lectures delivered in this country. He has been followed by others with equally munificent gifts. He pointed out the necessity to the practical man of work in the region of pure science, but as the workmen in this region are generally those who have neither the time nor the means for original research, the necessity for an endowment to enable them to continue their work is evident. Reference was made to the difference between the German universities, where the professors are expected to do original work, leaving the teaching for instructors, and the American so-called universities and colleges where the professors seldom have the time to devote to anything outside of mere routine work. He mentioned the humiliating fact that at the Zoölogical Station at Naples, where Germany and Italy each maintain eight tables, Russia, Spain, Austria, and England three each, and Switzerland, Belgium and Holland one each at a cost of $500 per annum, the United States had none, and has been dependent heretofore upon the generosity of foreign nations for the occasional use of a table. This loss is not compensated for by the fact that there are several small laboratories along the Atlantic coast of this country. The endowment of research through fellowships in colleges was also considered, and lastly a detailed reference to scientific societies in this country and England. The comparison is not flattering to our pride. In England the property, funds and equipment of the societies is nearly ten-fold greater than in America. The publications are double. No laboratories and no professors are maintained here for original research. "The English societies," he said, "distribute yearly from $25,000 to $35,000 for from sixty to seventy-five different scientific purposes, while ours make *no* such appropriations simply because there are no funds."

Dr. H. Carrington Bolton, in his plea for a library of science in New York, gave many interesting facts relative to libraries of New York and its sister cities, arguing in favor of bringing together under one roof all the libraries of the societies in the Alliance. These libraries aggregate 13,700 volumes and would form an excellent nucleus for a scientific library. Reports received from sixty libraries of New York and its vicinity show that there are 1,916,000 volumes in them, the scientific books varying from 5 to 100 per cent. Fifteen of the libraries have over 40,000 volumes each. To house the libraries Professor Bolton outlined a plan. He advised having a building 100 × 120 feet square, four stories high in front, with a lecture room, in the rear, large enough to seat 1,000 persons. The library room should have shelves to accommodate 300,000 volumes. There should be an office for general business, several small rooms for ordinary meetings of the separate societies, photographic and microscopic laboratories and a general reception room. The plan is extensive, but let us hope that some wealthy New Yorker may make it feasible.

The second joint meeting of the Alliance was held on March 27, 1893, in memory of Dr. J. S. Newberry. The important business transacted after the reading of a memoir by Professor H. L. Fairchild, was a report of a committee recommending the establishment of an endowment fund of $25,000 for the purpose of encouraging original research. The fund is to be known as the John Strong Newberry Fund, and is to be administered under the direction of the Council of the Scientific Alliance. Blank forms for subscriptions of any amount will be cheerfully furnished by Dr. N. L. Britton, Columbia College, New York. The money will be used for furthering researches in geology, paleontology, botany and zoölogy, in all of which subjects Dr. Newberry was interested. About $600 in sums varying from $5 to $100, had been subscribed about a month ago.

A NOTE ON THE APPLICATION OF SCIENTIFIC METHOD TO LITERATURE.

BY C. MICHENER, SAN FRANCISCO, CAL.

PEOPLE have lately begun to study literary products inductively; but that study has been almost entirely systematic. Words, sentences, paragraphs, figures of speech, etc., are counted and classified, and from the results obtained some slight conclusions are drawn as to the development of style. This is undoubtedly good work. But it is easy work and perhaps it is on that account that we so readily see that it is good.

In the present paper I wish to propose something more difficult. I wish to indicate the use of a science as a tool in the study of literary products scientifically. The history of any science is a story of development by stages, each successive stage of advance caused by the application of another department of science to the investigation of the one in question, for example, mathematics to electricity.

Literature is a product of the mind, and its use and purpose are by and for the mind. Is it not then intimately connected with psychology, and should not an investigation and comparison of the facts of each be of benefit in determining the laws of each?

Let us take, for example, that exceedingly important part of most literary products, Plot. As an outline for the study of plot (not to be confounded, of course, with plot content), I would propose the following: —

(*A.*) *The psycholgical bases of plot.* Here the main part of the work is to be done. The exceedingly delicate mental phenomena included loosely under such terms as attention and interest are to be investigated by experiments as wide in range as possible; and from all this should result facts enough for the construction of the ideal plot and the determination of its structure. This we might call

The typical plot, that is, plot stripped of all accidental factors and limitations. The next step would be to consider the various adaptive modifications which this typical plot would undergo when subjected to the restraints and environment of the various great classes of literary products; and our investigations under the first head, and I think I may say such investigation only, will enable us to understand the differentiation. We should thus be led to consider the plot of the lyric, the epic, the drama, the novel, etc.

B. The temporal development of plot. Here we should commence from the other end as it were, and from the existing literary products trace the growth of plot from its beginning to the present; and from these records obtain the history of the development of those mental functions which plot presupposes. This second division is the natural and necessary complement and check of the first and should be as useful to psychology in this department and, in an analogous way, as paleontology is to zoölogy or botany.

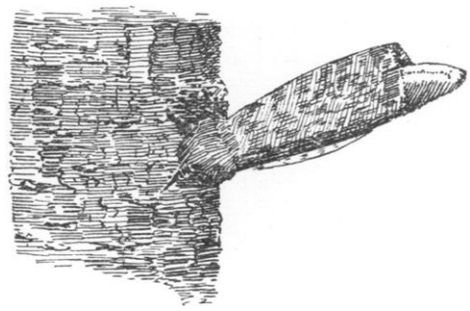
That the method here outlined is merely tentative I confess. It would, of course, be severely limited and the conclusions impaired by any limitation in the range of experiments under the first head; and in the present state of scientific psychology to be at all possible, the method would have to be materially modified to produce any result at all. I have, however, in this present note, only attempted to be suggestive, not conclusive.

LETTERS TO THE EDITOR.

A Case of Protective Mimicry.

THIS morning, as I was passing a small apricot tree standing in my yard, my attention was arrested by what appeared to be a short stub of a branch, about 1¼ inches long, projecting from the side of the tree about 20 inches from the ground. Having recently pruned the tree carefully, I wondered how I had happened to leave that stub, and at once applied my pocket-knife to remove it. Much to my surprise, I found that the supposed stub of a branch was a moth attached by its head to the side of the tree. The accompanying sketch represents its appearance.

The grayish-brown mottled color of the closed wings of the moth matched the color of the bark completely, and the angle made by the axis of its body with the tree was such as a branch would naturally make. It was attached, with its ventral surface uppermost, and the extremity of the abdomen, which projected beyond the closed wings, was nearly white, as seen from above, thus imitating very perfectly the central woody portion of the broken branch. Having turned the moth over in my attempt to remove the supposed branch, it assumed the natural position of such insects on the side of the tree, but upon returning a half-hour later I found it again in the position shown in the figure. Several



other persons who saw it were as completely deceived by its appearance as I had been, and it is easy to believe that the keen eyes of a hungry insect-eating bird might see there only the stub, and thus be cheated out of a breakfast. GEO. H. COLTON.

Hiram, O., June 11.

A Maya Month Name.

As every additional find in reference to the Maya manuscripts is of interest to some of the readers of *Science*, I submit the following item.

In the bottom line, Pl. 46, Dresden Codex, is the glyph shown in Fig. 1, which, as all students of these Codices admit, is the symbol for the Maya month *Kayab*. Here it is without the appendage which sometimes accompanies it. In Fig. 2, from the bottom line of the Dresden Codex, Plate 61, the form is more complete, and the appendage is present.

The signification given by Perez to the name of this month is "singing," from the Maya word *Kay*, "to sing, to warble," but a study of the symbol leads to quite a different interpretation. According to the interpretation heretofore given by me (*American Anthropologist*, July, 1893, p. 246) the character in the upper right-hand corner of the glyph has *b* as its chief phonetic element,

which is also one of the consonant sounds of the word *Kayab*, and the appendage is the month determinative. But I was unable at the time the article referred to was written to indicate the portion of the symbol denoting the *k'* element. A more thorough examination, as given in Fig. 2, has called my attention to the fact that in the left portion and general form we have precisely the symbol for *Aac* (*Ac*, *Ak*), the "turtle," as given in the upper division of Plate 17, Cortesian Codex. Following this interpretation, the true name of the month is *Acyab* or *Akyab*, which, for the sake of euphony, has been changed to *Kayab*. The derivation, according to this interpretation, will be from *Ac* or *Ak*, "turtle," and *Yab* or *Yaab*, "many, abundant, plentiful." Adding the month determinative, we obtain as the full signification, "The month when turtles abound." Whether or not turtles are most abundant on the coast of Yucatan during the month of June I am unable to say. The only evidence I have at hand relating to the subject is found in Mrs. LePlongeon's charming little work, "Here and There in Yucatan." In this she describes a trip along the coast in June, at which time turtle catching was in progress and attended with great success, the fishermen's pens being full. Dr. Schellhas (*Zeitschrift für Ethnologie*, 1892) notices the resemblance of this character to the turtle symbol.

This apparently furnishes, at least, a straw pointing in the direction I have been moving in my study of the Maya hieroglyphs.

CYRUS THOMAS.

Washington, D.C., July 15.

Historical Statements in Century Dictionary Contradicted by Other Authorities.

Napier's rods (or bones), a contrivance commonly attributed to John Napier (1550–1617), but in fact described in the Arithmetic of Oronce Finée (1532).—*Century Dictionary* under *rod.*

Die erste Beschreibung gab Nefer in seiner Rabdologia (Edinburg, 1617).—*Vorlesungen über Geschichte der Mathematik*, von Moritz Cantor, zweiter Band, Seite 660.

The earliest known writers on the subject (magic squares) were Arabians, among whom these squares were used as amulets.—*Century Dictionary*, under *magic.*

The earliest known writer on the subject was Emanuel Moscopulus, a Greek, who lived in the fourth or fifth century, and whose manuscript is preserved in the National Library at Paris.—*Encyclopedia Britannica*, under *magic squares.*

These seem to me to be contradictions. I should be glad to see the truth in regard to these historical facts plainly set forth by a reader of *Science.*

GEO. A. MILLER.

Eureka College, Eureka, Ill., July 24.

The Cambojan Khmers.

OWING to some irregularity in the postal delivery I have only just received *Science* for June 9, else I should have sooner asked leave to put in a claim of priority in connection with Dr. Maurel's new views regarding the "Aryan" origin of the Khmers, referred to by Dr. Brinton in that issue. Personally I avoid the expression "Aryan or Indo-European stock" as confusing and applicable far more to linguistic than to ethnical groups. But if "Caucasian," used in Blumenbach's sense, be substituted for "Aryan" Dr. Brinton will find, by consulting the Transactions of the British Association for 1879, that fourteen years ago I conclusively showed that the Khmers should be grouped not with the surrounding Mongolic, but with the Caucasic division of mankind. In the "Monograph on the Relations of the Indo-Chinese and Inter-Oceanic Races and Languages," read before the association, and again before the Anthropological Institute and printed in the journal of that society for February, 1880, and issued separately by Trübner at same date, I argued *generally* that "both of the great Asiatic types conventionally known as Caucasian and Mongolian, have from prehistoric times occupied the Indo-Chinese peninsula," and *particularly* that here the Caucasic stock is represented by the widespread Khmer group, that is to say, the Cambojans proper, the Kuys or Khmerdom ("original Khmers"), as the Cambojans call them, the Stiengs, Charays, Chams and many others, some still in the tribal state, some long civilized or semi-civilized. It is the civilized that mainly engage Dr. Maurel's attention, and that he rightly regards as Aryans (read Caucasians), but wrongly supposes to have migrated in comparatively recent times from India to Indo-China, "bringing with them the Aryan culture of that country as proved by the stately ruins of Ang-Kok (read Ongkor-Vaht)." There was no such migration "probably about the third or fourth century of the Christian era," for the Khmers are not recent arrivals, but the true aborigines, as shown by the presence of the Khmerdom and the kindred wild tribes, and also by their untoned polysyllabic speech, radically distinct both from the Indo-Chinese toned monosyllabic group and from the Indic (Sanscritic) branch of the Aryan, but closely allied to the untoned polysyllabic Malayo-Polynesian linguistic family.

This point, which I think I have established to the satisfaction of most ethnologists and philologists (Professor Sayce amongst others), is of far-reaching consequence. It affords the solution of the extremely difficult problem connected with the presence of Logan's "Indonesians," my Caucasians, side by side or intermin-

gled with the true Mongoloid Malays throughout the Oceanic domain (Indian and Pacific Oceans). But my object here is merely to establish my priority claim for the American readers of *Science*, who are referred to the above quoted monograph for the detailed treatment of these interesting questions. A. H. KEANE.

79 Broadhurst Gardens, South Hampstead, N. W., July 21.

Sound and Color.

WITHOUT in the least doubting the accuracy of Dr. Wallian's curious observations respecting the appearance of color about the heads of public speakers, I would just suggest the possibility of another explanation.

I have myself frequently observed, when listening to various preachers, a patch of rich blue color near to the head of the speaker. I have always attributed this, however, to the well-known effect upon the retina of fatigue from the continued impression of one color giving rise to a phantasm of the complementary color. The face of a speaker is some tint of flesh color. The eye of the listener is fixed upon the face, and in a short time the complementary phantasm makes its appearance, always some tint of blue or purple, according to the complexion of the speaker.

This will not, of course, explain all the phenomena mentioned by Professor Underwood and Dr. Wallian, but it is a factor which should not be forgotten in discussing the subject.

F. T. MOTT.

Leicester, England.

BOOK-REVIEWS.

A Biographical Index of British and Irish Botanists. By JAMES BRITTEN and G. S. BOULGER. London, West, Newman & Co., 1893. 203 p.

MESSRS. Britten and Boulger have republished in book form their "Index of British and Irish Botanists." The matter originally appeared in the *Journal of Botany* from 1888 until 1891, but in 203 pages of the reprint a large amount of additional material is given. This is shown by the fact that 1,825 names are given in the volume, against 1,619 given in the *Journal of Botany*. In a succinct form and by means of a series of readily understood abbreviations there are given the dates of birth and of death, place of birth and death, place of burial, indication of social position or occupation, university degrees or titles or offices held, and dates of election to the Linnæan and Royal societies. Mention is also made of the whereabouts of any correspondence or MSS. and the existence of any herbarium or plants collected. Various biographical dictionaries, where further information may be obtained, are also referred to. Any portrait, original or engraved, and any genus, or, failing this, any species, dedicated to the person, is mentioned. From this it will be seen that a large amount of information is gathered within a small compass, and the volume will be of great assistance in looking up facts relative to any one of the 1,825 names included within its pages.

JOSEPH F. JAMES.

Washington, D. C., July 22.

AMONG THE PUBLISHERS.

HANN & ADAIR, Columbus, O., announce "A History of the German Language from the Earliest Times to the Present Day," by Chas. W. Super, president of the Ohio University at Athens. The purpose of the author has been to write a book that may be read with interest and profit by persons whose knowledge of German does not extend beyond the rudiments. It has been his aim to make duly prominent the common origin of the English and German languages and to use many facts of the former to elucidate those of the latter, so far as it can be done within the space at command. The book also discusses incidentally some phenomena common to all civilized tongues. By the same author is "Weil's Order of Words in the Ancient Languages Compared with that of the Modern Languages," published by Ginn & Co., Boston, Mass.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

Wanted to exchange.—Medical books, Obstetrical Transactions, London, Works of Sir J. Y. Simpson, Beck's Medical Jurisprudence. Hand book for the Physiological Laboratory, by Burnton, Foster, Klein and Sanderson, Quain's Anatomy, and about fifty others. Catalogues given. Want Geological, Botanical and Microscopical books in exchange. Dr. A. M. Edwards, 11 Washington St., Newark, N. J.

A complete set of Bulletins of U. S. Geological Survey, various reports and bulletins of surveys of Missouri, Arkansas, Minnesota, Alabama, Illinois, New York, Pennsylvania, Indiana, Ohio and Texas; iron ores of Minnesota; Wailes' Agriculture and Geology of Mississippi (rare). To exchange for periodicals and books on Entomology or for Lepidoptera. Rev. John Davis, the Deanery, Little Rock, Ark.

For sale or exchange.—A complete set of the report of the last Geological Survey of Wisconsin, T. C. Chamberlin, geologist. It consists of four large volumes, finely illustrated, and upwards of forty large maps and charts. Will sell for cash or exchange for a microscope. Address Geo. Beck, Platteville, Wis.

For sale or exchange for copper coins or rare postage stamps. Tryon's American Marine Conchology, containing hand colored figures of all the shells of the Atlantic coast of the United States. Presentation copy, autograph, etc. One vol., half morocco, 8vo, usual price, $25, postpaid, $15. Botany of the Fortieth Parallel of the Hundredth Meridian of the Pacific R. R. Survey. Other Botanical works and works on Ethnology. F. A. Hassler, M.D., Santa Ana, Cal.

I have a fire-proof safe, weight 1,150 pounds, which I will sell cheap or exchange for a gasoline engine or some other things that may happen to suit. The safe is nearly new, used a short time only. Make offers. A. Lagerstrom, Cannon Falls, Minn., Box 857.

For exchange.—Hudson River fossils in good condition from the vicinity of Moore's Hill, Ind., also land and fresh water shells. Desire fossils and shells from other groups and localities. Address Geo. C. Hubbard, Moore's Hill, Ind.

I wish to exchange a collection of 7,000 shells, 1001 species and varieties, American and foreign, land, fluviatile and marine, for a good microscope and accessories. Address, with particulars, Dr. Lorenzo G. Yates, Santa Barbara, California.

Wants.

WANTED—Panorpidae, Myrmeleoninae, and literature on the same. Chas. C. Adams, Bloomington, Ill.

WANTED.—Assistant in Nautical Almanac office, Navy Department. The Civil Service Commission will hold an examination on August 15 to fill a vacancy in the position of assistant (computer) in the Nautical Almanac office. The subjects will be letter-writing, penmanship, trigonometry, rudiments of analytical geometry and calculus, logarithms, theory and practice of computations, and astronomy. Each applicant must provide himself with a five-place logarithmic table. The examination will be held in Washington, and if applications are filed in season, arrangements may be made for examinations in the large cities. Blanks will be furnished upon application to the Commission at Washington.

DRAFTSMEN WANTED.—The Civil Service Commission will hold examinations on August 15 to fill two vacancies in the War Department; one in the position of architectural draftsman, salary $1,400, the other in the position of assistant draftsman, Quartermaster General's office, salary $1,200. The subjects of the architectural draftsman examination are letter-writing, designing specifications and mensuration, and knowledge of materials; of the assistant draftsman examination they are letter-writing, tracing, topographic drawing and projections. The examination will be held in Washington, and if applications are filed in season, arrangements may be made for examinations in the large cities. Blanks will be furnished upon application to the Commission at Washington.

A YOUNG man who has been through the course in mathematics in Princeton University, wishes some tutoring this summer. Rates reasonable. Address P. H. Westcott, Cramer's Hill, Camden Co., N. J.

A GRADUATE of an American Polytechnic institution and of a German university (Göttingen), seeks a position to teach chemistry in a college or similar institution. Five years' experience in teaching chemistry. Address Chemist, 757 Cary St., Brockton, Mass.

AN experienced teacher in general biology wishes a position in a first-class college or university. Three years in post-graduate study. Extensive experience. Strong indorsements. Address E. W. Doran, Ph.D., 1327 G St., N. W., Washington, D. C.